Introduction

California’s Mediterranean-climate streams are known for dry summers with little or no precipitation from April to September, followed by a rainy season from December to March. The fauna in the streams are adapted to the extreme conditions of the long dry summer and the dramatic increases in streamflow during the winter (Beche et al. 2006).

The combination of biotic factors such as living animals, plants, and abiotic factors such as a habit or characteristic of a stream, temperature, and weather create an ecosystem of living and nonliving elements. Streams in Mediterranean climates tend to be affected by heavily populated cities that are growing faster than the environment can handle (Gasith and Resh 1999).

Benthic (sediment dwelling) macro invertebrates are insects or other invertebrates that can be seen with the naked eye. They are often used in bioassessment to evaluate the health of stream ecosystems and assess the effects of human impacts such as habitat degradation and/or pollution.

Commonly used bioassessment metrics may also be affected by seasonal or intraseasonal factors such as precipitation and temperature; however, few studies have examined the changes that occur within the macro invertebrate populations due to seasonal patterns in Mediterranean climates. It is important to understand how seasonal factors influence bioassessment metrics in order to quantify the contribution of human impacts.

The objectives of this study are (1) to determine how the benthic macro invertebrate populations change between seasons and fluctuate within seasons; and (2) to identify correlations between benthic macro invertebrate community changes (species abundance and bio-assessment indices) and seasonal factors such as precipitation, stream flow, and temperature.

Methods

The study was performed from October 2010-June 2011 once a month along with using data that was previously collected twice a month from March 2004-July 2005. The study is located on Strawberry Creek, which flows through the University of California Berkeley campus, and discharges into San Francisco Bay (Charbonneau, & Resh, 1992). We collected samples at 4 different stream sites using a 500 micrometer D-frame kick net to collect benthic invertebrates 1-m across the stream, at three riffle locations at each site. Samples were preserved in 95% ethanol, and invertebrates were sorted under a dissection microscope and identified to family level. Bioassessment indices will be used in order to characterize the stream. Analysis of the data will show if there is a correlation between benthic macro invertebrate community changes and seasonal factors such as precipitation, stream flow, and temperature.

Results

Figure 1 and 2 (2004-2005) and 3 and 4 (2010-2011) show all the individuals collected from all four sampling sites combined (A.C.D,E). The very low R-squared values shown in Figures 2 (0.001) and 4 (0.076) indicates that there is no correlation between the number of Baetidae individuals and the total precipitation occurring 2 weeks prior to the sample date. Similarities in both graphs display inconsistency in precipitation and Baetidae abundance.

Discussion/Conclusion

We have not yet collected enough data to analyze and conclude if our research shows a correlation between seasonal patterns and the benthic macro invertebrate populations. However, with the graphs shown we conclude that there is no obvious correlation between the number of individuals and precipitation.

Therefore, we will further investigate other factors that may lead to the changes in the streams fauna. We did see a wide fluctuation in abundance during the wet and dry seasons. However, there is no clear relationship with precipitation or air temperature in our data that we have been analyzing so far.

Designing a multi-axis line graph helped in providing an accurate representation of the data collected. The R-squared value and the trend line were used in order to show whether there was a correlation between the abundance of individuals and abiotic factors such as precipitation. Additional data is in the process of being collected continually to ensure proper data analysis in order to discuss if seasonal patterns have an effect on the sediment-swelling macro invertebrates.

Uncertainties in the research include accuracy of family identification and the fact that no data has been collected yet during dry years.

Lastly, further studies are needed to produce a more definite conclusion. Future data evaluation will include multivariate regression analysis to determine the contributions of abiotic factors such as precipitation, air temperature, water temperature, and flow rates on species abundance and frequently used bioassessment metrics.

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References


